

**Materials/Equipment required: scantron sheet, scientific calculators, scrap paper**

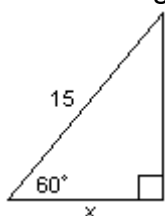
**Special Instructions: Students are permitted to use one handwritten reference sheet which should be submitted with the completed exam. Formulas are on the last page.**

**PART A – Multiple Choice: Fill in the scantron sheet with your answers.**

1. If  $\cos 37^\circ = \frac{43}{x}$ , what is the value of  $x$ ?

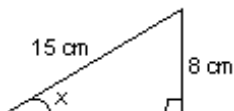
- a) 34.3                      b) 0.0186                      c) 53.8                      d) 147.1

2. Find the length of side  $x$ :



- a) 13                      b) 7.5  
c) 30                      d) 26

3. Find the measure of angle  $x$ :



- a)  $58^\circ$                       b)  $32^\circ$   
c)  $0.53^\circ$                       d)  $\frac{8}{15}^\circ$

4. Which of the following statements is TRUE?

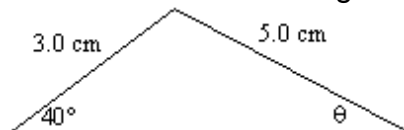


- a)  $\sin B = \frac{a}{c}$                       b)  $\cos A = \frac{a}{c}$   
c)  $\tan B = \frac{a}{b}$                       d)  $\sin A = \cos B$

5. The angle of elevation to the top of a flagpole is  $67^\circ$  when measured from a point 5m from the base of the pole. To the nearest metre, what is the height of the flagpole?

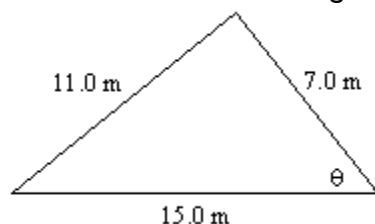
- a) 2m                      b) 15m                      c) 12m                      d) 5m

6. Find the measure of angle  $\theta$  to the nearest degree:



- a)  $23^\circ$                       b)  $140^\circ$                       c)  $40^\circ$                       d)  $67^\circ$

7. Find the measure of angle  $\theta$  to the nearest degree:



- a)  $13^\circ$                       b)  $43^\circ$                       c)  $137^\circ$                       d)  $47^\circ$

8. If  $\angle G$  is obtuse, which would have a negative value?

- a)  $\sin G$                       b)  $\cos G$                       c)  $\tan G$                       d) both  $\cos G$  and  $\tan G$

9. Estimating beyond the known values in a scatter plot is called

- a) line of best fit                      b) interpolation                      c) extrapolation                      d) outliers

10. The number that indicates how close the points in a scatter plot are to forming a line is called the

- a) correlation coefficient                      b) standard deviation

c) line of best fit

d) quadratic

11. Which of the following values of  $r$  is used to describe a set of data with a weak negative correlation?

a) -0.23

b) 0.96

c) -0.99

d) 1.00

12. Which of the following objects can be used to display two-variable data?

a) bar graph

b) circle graph

c) scatter plot

d) histogram

13. What are the mean and median (in that order) for the set of values: 2, 5, 2, 8, 3?

a) 2, 4

b) 3, 4

c) 4, 2

d) 4, 3

14. The height of a 17 year old male student is in the upper quartile for height for boys aged 16 to 18. This means that:

a) his height is average for his age

b) he is taller than 25 % of boys aged 16 to 18

c) he is shorter than 25% of boys aged 16 to 18

d) he is taller than at least 75% of boys aged 16 to 18

15. Which of the following statements is false?

a) the sample size should be 50% of the population for an effective statistical study

b) a strong correlation may or may not indicate a cause-and-effect relationship

c) to determine if a conclusion is valid, you must consider the sampling technique and the data gathering technique

d) a three-dimensional circle or bar graph may be misleading

16. Which of these graphs best represents growth with constant rate of change?

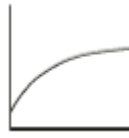
a)



b)



c)



d)



17. The formula relating the safe load,  $m$ , that can be supported by a beam of length  $l$ , thickness  $t$ , and height  $h$  is  $m = \frac{4th^2}{l}$ . A correct rearrangement of this formula is:

a)  $t = \frac{ml}{4h^2}$

b)  $l = \frac{4m}{th^2}$

c)  $h = \sqrt{\frac{mtl}{4}}$

d)  $h = \left(\frac{ml}{4t}\right)^2$

18. Between which values does the solution to  $5^x = 100000$  lie?

a) 2 and 4

b) 4 and 6

c) 6 and 8

d) 8 and 10

19. The formula  $m = 3.5(0.5)^{\frac{t}{8}}$  gives the mass,  $m$  milligrams, of radioactive Iodine in a sample  $t$  days after the initial measurement. The mass after 4 days would be:

a) 2.47 mg

b) 0.22 mg

c) 0.88 mg

d) 3.5 mg

20. Which of the following statements is FALSE?

a) an annuity can be used to save for a financial goal

b) a mortgage is an example of an annuity

c) an annuity must have identical payment and compounding periods

d) an annuity can be used to repay a debt

21. Which of the following could you use to calculate the regular monthly payment to pay back a loan of \$5000 over 3 years at 4.8% per year compounded monthly?

a)  $R = \frac{5000 \times 0.048}{[1 - (1 + 0.048)^{-36}]}$

b)  $R = \frac{5000 \times 0.004}{[1 - (1 + 0.004)^{-36}]}$

c)  $R = \frac{5000 \times 0.048}{[1 - (1 + 0.048)^{-3}]}$

d)  $R = \frac{5000 \times 0.004}{[1 - (1 + 0.004)^{-3}]}$

22. If you spend \$75 each week on food, how much should you budget monthly for food?

a) \$300

b) \$325

c) \$375

d) \$337.50

23. Which of the following is NOT considered an **initial** cost related to purchasing a home?

a) down payment

b) home inspection

c) moving costs

d) utilities

24. Which of the following is an expense that only property **owners** must budget for?
- a) property tax      b) hydro      c) phone      d) heat
25. Which of the following is a **fixed** cost in a monthly budget?
- a) rent      b) phone      c) gas      d) food

**PART B – Short Answer: Write your answer only in the space provided.**

1. What type of relations are the following? (linear, quadratic, exponential)

a)  $y = 2x + 10$  \_\_\_\_\_

b)

x	y
-2	0.25
0	1
2	4
4	16
6	64
8	256

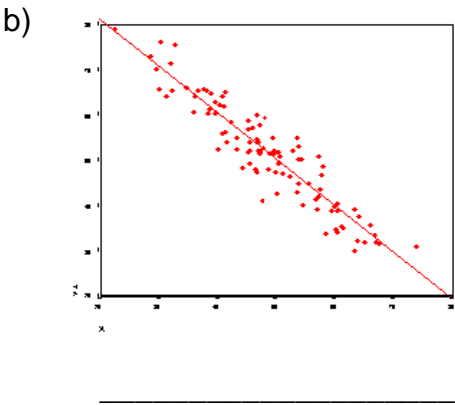
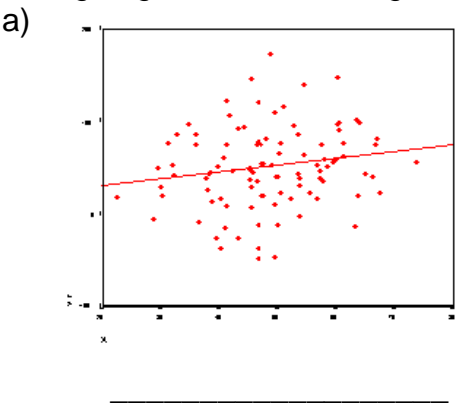
\_\_\_\_\_

c)



\_\_\_\_\_

2. In each of the scatter plots below, describe the correlation as strong positive, weak positive, strong negative or weak negative.



3. Solve for  $a$ . Round your answer to **one** decimal place.

$a^2 + 7^2 = 15^2$  \_\_\_\_\_

4. A farmer wants to enclose a rectangular field with 400 m of fencing so that it encloses the largest possible area. What should the dimensions of the field be if:

- a) he must fence all 4 sides? \_\_\_\_\_
- b) he only needs to fence 3 sides? \_\_\_\_\_

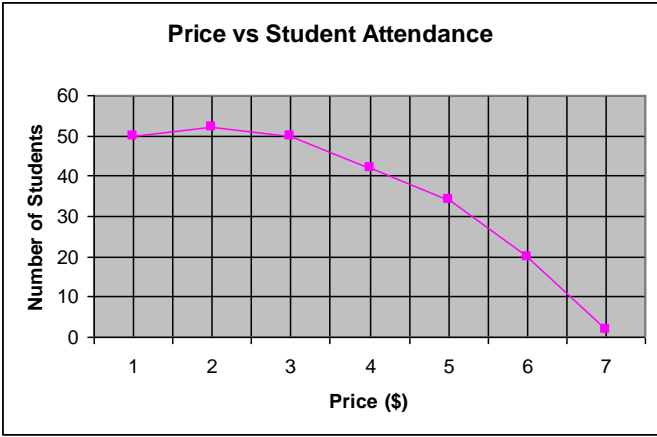
5. Convert each measure. Round to two decimal places if necessary.

- a) 12 yards to metres (1 yard  $\div$  0.9144 m) \_\_\_\_\_
- b) 9 kg to pounds (1 pound  $\div$  0.454 kg) \_\_\_\_\_
- c) 3 gallons to litres (1 gallon  $\div$  3.785 L) \_\_\_\_\_

6. A student measures the age in years and the diameter in centimeters of a particular species of tree. She draws a scatter plot of the data, putting age on the horizontal axis ( $x$ ) and diameter on the vertical axis ( $y$ ). She determines the equation of the line of best fit to be:  $y = 1.32x - 2.48$

- a) Estimate the age to the nearest year of a tree with a diameter of 12 cm. \_\_\_\_\_
- b) Estimate the diameter to the nearest tenth of a centimeter for a 20 year old tree. \_\_\_\_\_

7. Students' council has decided to introduce school movie nights at South. Research was conducted and the data collected is graphed below.



- a) What is the maximum number of students that can be expected to show up for a movie night? \_\_\_\_\_
- b) At what ticket price would there be a maximum turnout? \_\_\_\_\_
- c) At what price would 20 students attend? \_\_\_\_\_
- d) At what price would the fewest students attend? \_\_\_\_\_

8. Evaluate. Leave answers as fractions in lowest terms.

- a)  $(-4)^{-3}$   
=
- b)  $\left(\frac{100}{49}\right)^{\frac{1}{2}}$   
=
- c)  $125^{\frac{2}{3}}$   
=
- d)  $16^{\frac{1}{2}}$   
=

9. Solve for  $x$ :

- a)  $2^x = 2^{10}$   
 $x =$  \_\_\_\_\_
- b)  $3^x = 9^{x-1}$   
 $x =$  \_\_\_\_\_
- c)  $x^3 = 64$   
 $x =$  \_\_\_\_\_
- d)  $x^{\frac{3}{2}} = 8$   
 $x =$  \_\_\_\_\_

10. A pie chart shows that for a college student, 35% of his monthly expenses are tuition. If his total monthly expenses are \$1500, how much does he spend on tuition?

\_\_\_\_\_

11. Name two ways to reduce the total interest paid on a mortgage.

\_\_\_\_\_  
\_\_\_\_\_

12. As a college student, name two things that must be taken into consideration when choosing a location for a place to rent.

\_\_\_\_\_  
\_\_\_\_\_

**PART C – Full Solutions: Show all work below the question including formulas used, substitution and concluding statements with correct units.**

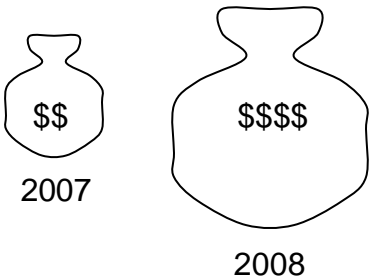
1. Solve  $\triangle DEF$  given  $\angle D = 72^\circ$ ,  $e = 13.4$  cm, and  $f = 17.1$  cm. Round side lengths to one decimal place and angles to the nearest degree. (Include a labeled diagram) [6]

2. From the top of a lighthouse on a cliff, the angles of depression of 2 boats in the same vertical plane are measured as being  $5.4^\circ$  and  $3.6^\circ$ . The boat closest to the shore is 1000 metres from the base of the cliff. Draw and label your diagram to answer the questions that follow.

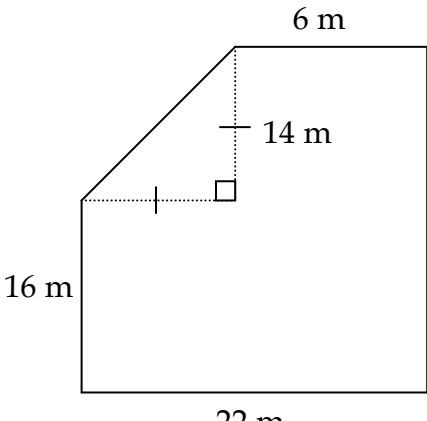
a) Determine the height of the cliff correct to one decimal place. [2]

b) How much further from the base of the lighthouse is the second boat? [3]

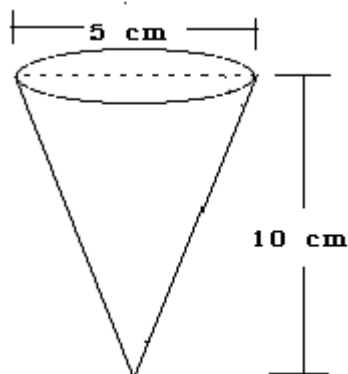
3. A company doubled their profits this year. Explain why the following picture is misleading and re-draw the picture so that it more accurately displays the increase in profits. [2]



4. Calculate the perimeter and area of the following figure correct to the nearest tenth. [5]

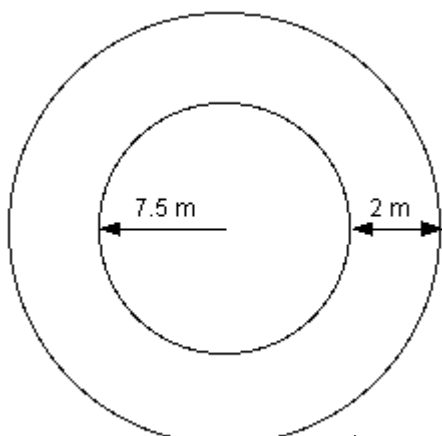


5. a) Calculate the surface area of the paper drinking cup shown correct to two decimal places. [2]



- b) If the cost of paper to produce drinking cups is  $\$1.78/m^2$ , what is the cost of the paper needed to produce 5000 drinking cups? ( $10\,000\text{ cm}^2 = 1\text{ m}^2$ ) [3]

6. A circular in-ground pond has a radius 7.5 m. A 2 m wide concrete deck will be constructed around the pond. The concrete should be at least 15 cm thick. Calculate the volume of concrete required to construct the deck correct to one decimal place. [3]



7. Grace is saving to buy a \$20000 car in 3 years. She deposits \$550 every month into an account that earns interest at 6%/a compounded monthly. Will she have enough money to buy the car? Justify your answer by showing all calculations. [3]
8. You borrow \$10 000 and must pay it back over 4 years at an interest rate of 7.2%/a compounded monthly. [3]
- a) Calculate your monthly payment.

b) Calculate the total interest paid.

9. Joe is studying to become a personal support worker. He has a part-time job and his net bi-weekly income is \$700. His rent is \$425 per month, including utilities. His other expenses are: transportation costs of \$75 per month, grocery expenses of \$70 per week, tuition expenses of \$500 per month, expenses for books and supplies of \$1300 per year and miscellaneous expenses of \$50 per week. [8]
- a) Design a simple monthly budget for Joe and determine whether he is earning enough to cover his expenses.

Budget Item	Monthly Amount (\$)
INCOME	
Total Income	
EXPENSES	
Total Expenses	
Total Income – Total Expenses	

b) Suggest two changes that Joe could make to help balance his budget.

FORMULAS

Trigonometry:

$a^2 + b^2 = c^2$  $\sin \theta = \frac{opp}{hyp}$  $\cos \theta = \frac{adj}{hyp}$  $\tan \theta = \frac{opp}{adj}$

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$  $a^2 = b^2 + c^2 - 2bc \times \cos A$  $A = \cos^{-1}\left(\frac{b^2 + c^2 - a^2}{2bc}\right)$

Measurement:

Rectangle:  $P = 2(l + w)$   
 $A = lw$

Parallelogram:  $P = 2b + 2s$   
 $A = bh$

Triangle:  $P = s_1 + s_2 + s_3$

Trapezoid:  $P = s_1 + s_2 + s_3 + s_4$

$$A = \frac{1}{2}bh$$

$$A = \frac{h(a+b)}{2}$$

Circle:  $C = 2\pi r$  or  $C = \pi d$   
 $A = \pi r^2$

Sphere:  $SA = 4\pi r^2$   
 $V = \frac{4}{3}\pi r^3$

Rectangular Prism:  $SA = 2(wh + lw + lh)$   
 $V = l \times w \times h$

Cylinder:  $SA = 2\pi r^2 + 2\pi rh$   
 $V = \pi r^2 h$

Cone:  $SA_{lateral} = \pi rs$   $SA_{base} = \pi r^2$   
 $SA_{total} = \pi rs + \pi r^2$   $V = \frac{1}{3}\pi r^2 h$

Pyramid:  $SA_{triangle} = \frac{1}{2}bs$   $SA_{base} = b^2$   
 $SA_{total} = 4\left(\frac{1}{2}bs\right) + b^2$   $V = \frac{1}{3}b^2 h$

**Optimization Formulas:**

Rectangles:  $s = \frac{P}{4}$        $s = \sqrt{A}$        $P = 4s$        $A = s^2$

Square-Based Prisms:  $h = \frac{V}{s^2}$        $h = \frac{SA - 2s^2}{4s}$        $SA = 6s^2$        $V = s^3$

Cylinders:  $h = \frac{V}{\pi r^2}$        $h = \frac{SA - 2\pi r^2}{2\pi r}$        $SA = 6\pi r^2$        $V = 2\pi r^3$

**Annuities:**

$A = \frac{R[(1+i)^n - 1]}{i}$        $R = \frac{A \times i}{[(1+i)^n - 1]}$        $I = A - R \times n$

$PV = \frac{R[1 - (1+i)^{-n}]}{i}$        $R = \frac{PV \times i}{[1 - (1+i)^{-n}]}$        $I = R \times n - PV$